

### Remarks

The Applicants have amended Claims 132 and 133 to recite that the nanofiber synthetic paper comprises disarranged nanofibers wherein the ratio ( $L/D$ ) of the fiber length  $L$  (mm) to the number average single fiber diameter  $D$  (mm) is 3,000-50,000. Support may be found in paragraph [0095] of the original specification and the Examples.

Both claims have also been amended to change 60% to 70%.

Claim 134 has been amended to change 50% to 60%. Support may be found in paragraphs [0075], [0077] and [0095] of the Applicants' original specification.

Finally, Claims 132 and 133 have been amended to remove "adequate" and "short."

Entry of the above changes into the official file is respectfully requested.

Claims 132-134 and 136-150 stand rejected under 35 USC §112 as being indefinite with respect to "short" and "adequate." The Applicants have, as noted above, eliminated both terms from Claims 132 and 133. Withdrawal of the rejection is respectfully requested.

Claims 132-134 and 136-150 stand rejected under 35 USC §103 over Chhabra. The Applicants respectfully submit, however, that Chhabra fails to disclose, teach or suggest the subject matter of those claims.

For example, the rejection states on page 3 of the Official Action that Chhabra discloses in paragraph [0036], that the diameters of the nanofibers are preferably between 100-900 nm. The Applicants reproduce the relevant portion of paragraph [0036] of Chhabra as follows:

Preferably, a significant number of fibers in a layer will have a fiber diameter of less than about 900 nanometer and more preferably from about 100 nanometers to about 900 nanofibers.

There is, however, a problem with this disclosure. In particular, that disclosure refers simply to the diameters of the nanofibers. However, that is not what the Applicants claim.

Instead, the Applicants claim “number average single fiber diameter.” This is completely different from the simple diameters of the nanofibers. This is important because the total possible range of the diameters of the nanofibers does not determine the number average single fiber diameter. The Applicants therefore respectfully submit that Chhabra is inapplicable on this basis alone.

The Applicants’ Claims 132 and 134 also recite 70% or more and the sum  $P_a$  of single fiber ratios. Similarly, Claim 134 recites that the index  $P_b$  of extremal coefficient of the single fiber diameters defined as the median is 60% or more. Neither of these claimed aspects are even remotely disclosed, taught or suggested by Chhabra. Thus, this is another reason why Chhabra is completely inapplicable.

These differences are illustrated in paragraph [0018] of Chhabra and in paragraphs [0013], [0015] and [0016] in the Applicants’ original specification. The Applicants commend the Examiner’s attention to those portions of the disclosure to further appreciate these critical differences in the disclosure and teachings of Chhabra versus the Applicants’ claimed subject matter as described above.

However, there is more. Chhabra does not disclose, teach or suggest the Applicants’ claimed ratio ( $L/D$ ) of the fiber length  $L$  (mm) to the number average single diameter  $D$  (mm) as 3,000–50,000. In that regard, the Applicants note the helpful comments in the rejection on page 3 of the Official Action at line 10, which refers to paragraph [0031] of Chhabra reciting that the fine fibers have a “finite length.” However, that is sharply different from the ratio of the fiber length to the average number single diameter. The Applicants invite the Examiner’s attention to paragraph [0066] of the Applicants’ original specification, which states in relevant part

... If  $L/D$  is kept in this range, the dispersibility of nanofibers in the compound solution, emulsion or gel of this invention can be

enhanced. Furthermore, in the synthetic paper of this invention, if L/D is kept in the aforesaid range, a sheet having single nanofibers homogeneously dispersed in the synthetic paper can be obtained, and in addition, since the nanofibers can be more entangled with and adhesive to each other, the paper force of the synthetic paper can be enhanced.

The Applicants respectfully submit that there is simply no disclosure, teaching or suggestion of this claimed aspect in Chhabra. Hence, this is yet another reason why Chhabra is inapplicable to the solicited claims.

The rejection refers to the alleged obviousness of discovering optimum or workable ranges on the one hand, and optimization of result-effective variables on the other hand. The Applicants respectfully submit that those concepts do not apply to the above-described differences.

Why is this so? This is so because it is not obvious to optimize a claimed aspect that is not even recognized in the cited prior art. For example, while Chhabra discloses a range of single fiber diameters, there is no acknowledgement of the concept of number average single fiber diameter. Therefore, assuming *arguendo* that it is obvious to optimize the diameter of the nanofibers within the 100 to 900 nanometer fiber diameter disclosed by Chaabra, there is no disclosure, teaching or suggestion concerning number average single fiber diameter. It would therefore inherently follow that it would not be obvious to vary or optimize the number average single fiber diameter when that aspect has not even been disclosed by the cited prior art. Thus, there is no establishment in Chhabra of the number average single fiber diameter being a result-effective variable.

Similarly, it inherently follows that it would not be obvious to optimize the ratio of the fiber length to the number average single fiber diameter because Chhabra does not disclose or even recognize the number average single fiber diameter. It therefore inherently follows that it

would not be obvious to optimize the ratio when one of the two components of the ratio is not even disclosed by the cited prior art.

Moreover, the Applicants discovered, as noted above in paragraph [0066] of the original specification, that there are advantages by keeping the L/D ratio within the claimed range. For example, the dispersability of nanofibers in the compound solution emulsion or gel is enhanced and this results in the sheet formed from the nanofibers having single nanofibers homogeneously dispersed in the synthetic paper, which further results that the “paper force” or strength of the synthetic paper can be enhanced. This has nothing to do with optimizing aspects mentioned in the rejection such as on page 4 in the last several lines with respect to freeness, density, permeability, average pore size and the like. In sharp contrast, the Applicants have discovered a completely new and different phenomenon where the strength of the resulting synthetic paper can be increased by maintaining the L/D ratio within the claimed range.

Finally, the Applicants respectfully submit that the claimed L/D ratio demonstrates surprising and unexpected results with respect to fiber diameter. In that regard, the Applicants enclose an attached sheet which contains a Table A and a Table B. Table A is comprised of Examples taken from the Applicants’ specification. Table B is comprised of Comparative Examples taken from the Applicants’ specification. It can be seen that when the L/D ratio is within the claimed range of 3,000 to 50,000 that the fiber diameter D is within the nanometer range with a maximum (at least from the Examples) of 154 nm. This is sharply contrasted to L/D ratios that are below the claimed range, but in some cases close to the claimed range. Those fiber diameters are nearly all 2  $\mu$ m and in only one case is in the nanometer range. Even in that case it is almost 1  $\mu$ m. Thus, the Applicants respectfully submit that they have established criticality with respect to the claimed L/D ratio and that this ratio is an unexpected phenomenon

that would reasonably be expected by those skilled in the art. As a consequence, the Applicants respectfully submit that Chhabra is nonenabling with respect to all of the Applicants' claimed aspects and is inapplicable under §103. Withdrawal of the rejection is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,



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# For Explanatory Purposes Only

Table A. Examples of the application

	fiber length L	fiber diameter D	$L/D$
Example 29	2mm	57nm	35087
Example 30	2mm	58nm	34482
Example 31	2mm	59nm	33898
Example 32	2mm	59nm	33898
Example 33	2mm	57nm	35087
Example 34	2mm	114nm	17543
Example 35	2mm	57nm	35087
Example 36	2mm	57nm	35087
Example 37	2mm	59nm	33898
Example 38	2mm	56nm	35714
Example 39	2mm	192nm	19807
Example 40	2mm	154nm	12987
Example 41	1mm	60nm	16666

Table B. Comparative Examples of the application

	fiber length L	fiber diameter D	$L/D$
Com.Example 9	2mm	2 $\mu$ m	1000
Com.Example 10	3mm	2 $\mu$ m	1500
Com.Example 11	5mm	2 $\mu$ m	2500
Com.Example 12	3mm	2 $\mu$ m	1500
Com.Example 13	3mm	2 $\mu$ m	1500
Com.Example 14	3mm	2 $\mu$ m	1500
Com.Example 15	3mm	2 $\mu$ m	1500
Com.Example 16	3mm	2 $\mu$ m	1500
Com.Example 17	3mm	2 $\mu$ m	1500
Com.Example 18	2mm	883nm	2265